COLLISION REPAIR TECHNOLOGY

PURPOSE

To evaluate each contestant's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of collision repair technology.

First, refer to General Regulations, Page 9.

CLOTHING REQUIREMENT

Official SkillsUSA light blue work shirt and navy pants, black or brown leatherwork shoes, and safety glasses with side shields or goggles. (Prescription glasses can be used only if they are equipped with side shields. If not, they must be covered with goggles.) To purchase official work clothes, contact Midwest Trophy Manufacturing Co. Inc. by calling 800-324-5996 or order online at www.mtmrecognition.com/skillsusa/.

Note: Contestants must wear their official contest clothing to the contest orientation meeting.

ELIGIBILITY

Open to active SkillsUSA members enrolled in programs with collision repair technology as the occupational objective.

EQUIPMENT AND MATERIALS

1. Supplied by the technical committee: Basic equipment of an auto body and refinishing laboratory
   a. Materials for metalworking phase:
      1. Identical fenders to be repaired
      2. Plastic filler
      3. Various grits of sandpaper/grinding discs
      4. Plastic filler mixing boards and spreaders
   b. Materials for plastic repair phase:
      1. Cleaning solvent
      2. Plastic repair material
      3. Mixing boards and spreaders
      4. Abrasive discs and sheets
      5. Plastic car parts
      6. Clamps
   c. Materials for estimating phase:
      1. Vehicle owner's name and address
      2. Scratch pads
      3. Estimate sheets
      4. Estimate books
      5. Calculator
      6. Parts price list for car involved
2. Supplied by the contestant:
   a. Safety glasses with side shields
   b. Dust respirator
   c. Body files
   d. Dollies
   e. Various metal finishing hammers
   f. 6" DA sander
   g. Grinder
   h. Die grinder
   i. Cartridge-type respirator (charcoal-filtered)
   j. Welding goggles
   k. Welding gloves
   l. Welding jacket
   m. Skull cap
   n. Welding respirator
   o. Welding helmet
   p. Face shield
   q. Hook-it and sticky back DA pad
   r. 9/16" and 5/8" wrenches
   s. DA pad wrench
   t. Sanding pads
   u. Sanding blocks
   v. Converter extension hose
   w. Tape measure
   x. One-page, typewritten résumé

SCOPE OF THE CONTEST

The contest is defined by industry standards as set by the current industry technical standards. The contest is divided into four portions: a written ASE exam, an interview, a manually written estimate and a series of workstations. Contestants will demonstrate their ability to perform tasks selected from the following list of competencies as determined by the SkillsUSA Championships technical committee. Committee membership includes: 3M Co., Automotive Service Association, BMW Performance Center, Caliber Collision Centers, Chief Automotive Systems Inc., I-CAR Tech Centre, Miller Electric Mfg. Co. Inc., National Institute for Automotive Service Excellence, Snap-on Inc., State Farm Insurance Companies, and Toyota Motor Sales U.S.A. Inc.

Knowledge Performance

The contest will include a 50-question ASE written exam assessing knowledge of Non-Structural Analysis, Structural Analysis and Mechanical and Electrical Components as follows:

A. Non-Structural Analysis — 22 questions in Non-Structural Analysis and Damage Repair (B3) ASE Certification Test in the content areas of: preparation, outer body panel repairs, replacements, metal finishing and body filling, glass and hardware, welding, cutting and removal and plastic repair*
B. Structural Analysis — 14 questions in Structural Analysis and Damage Repair (B4) ASE Certification Test in the content areas of: frame inspection and repair, unibody inspection, measurement and repair, stationary glass and metal welding and cutting*
C. Mechanical and Electrical Components —14 questions in Mechanical and Electrical Components (B5) ASE Certification Test in the content areas of: suspension and steering, electrical, brakes, heating and air conditioning, engine cooling systems, drive train, fuel intake and exhaust systems and restraint systems*

Skill Performance

The contest includes a series of workstations, a manually written estimate and an interview process designed to assess skills in the following areas: metalwork, welding, plastic repair, structural analysis and estimating. The overall appearance of the finished product, speed and proper safety practices will be judged.

Note: "*" Denotes this material is covered on a separate written test prior to the official contest day.

Standards and Competencies

CRT 1.0 — Repair depressed area(s) on a steel panel with plastic body filler to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair/Refinishing Non-Structural Analysis and Damage Repair (B3) Technical Standards

1.1 Model proper safety procedures
1.2 Clean contaminants from a damaged panel
1.3 Locate surface irregularities on a damaged panel
1.4 Remove finish from the damaged area(s) as necessary
1.5 Apply hammer and dolly techniques to repair damage
  1.5.1 Differentiate between pressure in relation to the concept of force to realign a component
1.6 Mix and apply plastic body filler on a steel panel
  1.6.1 Determine the relative proportion of the desired versus the undesired ingredients or elements of a mixture, and determine if that proportion is within the manufacturer's specifications
  1.6.2 Describe chemical reactions that occur in various compounds and substances
  1.6.3 Identify the role an additive or catalyst plays in the mixing of plastic fillers
  1.6.4 Define the criticality of metals with different hardness depending upon the function and location of the metal as well as how plastic fillers adhere to metal
1.7 Shape plastic body filler to proper contour

CRT 2.0 — Repair depressed area using shrinking techniques on a steel panel to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair/Refinishing Non-Structural Analysis and Damage Repair (B3) Technical Standards

2.1 Model proper safety procedures
2.2 Clean contaminants from a damaged panel
2.3 Locate surface irregularities on a damaged panel
2.4 Remove finish from the damaged area(s) as necessary
2.5 Identify hammer and dolly techniques to repair damage
  2.5.1 Demonstrate the understanding of the pressure in relation to the concept of force to realign a component
2.6 Describe the cold shrinking process as necessary
2.7 Describe the heat shrinking process as necessary
  2.7.1 Demonstrate an understanding of the effect that adding heat will cause in a state of matter, such as changinga solid to a liquid

CRT 3.0 — Repair depressed areas using metal finishing techniques on a steel panel to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair/Refinishing Non-Structural Analysis and Damage Repair (B3) Technical Standards

3.1 Model proper safety procedures
3.2 Clean contaminants from a damaged panel
3.3 Locate surface irregularities on a damaged panel
3.4 Remove finish from the damaged area(s) as necessary
3.5 Demonstrate various uses of the metal finishing tools

CRT 4.0 — Prepare steel panel for primer application to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair/Refinishing Painting and Refinishing (B2) Technical Standards

4.1 Model proper safety procedures
4.2 Clean contaminants from a damaged panel
4.3 Featheredge paint/E-coat as necessary
4.4 Sand/Scuff bare metal as necessary
  4.4.1 Demonstrate an understanding of the criticality of metals with different hardness depending on the function and location of the metal as well as how plastic fillers adhere to metal

CRT 5.0 — Demonstrate welding skills needed for collision repair of steel panels to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Non-Structural Analysis and Damage Repair (B3) Technical Standards, National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Structural Analysis and Damage Repair (B4) Technical Standards, and the I-CAR Welding Qualification Test

5.1 Make a plug weld using 18 gauge metal coupons in the vertical position using a MIG welder
5.2 Make a butt joint with backing weld using 18 gauge metal coupons in the vertical position using a MIG welder
5.3 Make a fillet weld on lap joint using 18 gauge metal coupons in the vertical position using a MIG welder
5.4 Make a plug weld using 18 gauge metal coupons in the overhead position using a MIG welder
5.5 Make a butt joint with backing weld using 18 gauge metal coupons in the overhead position using a MIG welder
5.6 Make a fillet weld on lap joint weld using 18 gauge metal coupons in the overhead position using a MIG welder

CRT 6.0 — Exhibit cosmetic surface repairs with plastic car parts to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Non-Structural Analysis and Damage Repair (B3) Technical Standards

6.1 Model proper safety procedures
6.2 Identify damage preparation before adhesive work
6.3 Perform appropriate abrasive grade sequence for plastic repair (Typically 50, 80, 180, adhesive application, 80, 180, 320)
6.4 Perform very coarse grade scratches (80 grit) inside valley of repair but not on surrounding plastic to avoid creating "fuzzies" which will be difficult to conceal in the finished paint work
6.5 Differentiate between "Veeing Out" a repair (incorrect) and "Dishing Out" a repair (correct) and how that relates to the finished product (no ghost lines)
6.6 Remove paint and feather the damage into the surrounding area with 180 grit abrasive

CRT 7.0 — Complete surface preparation for painting and refinishing to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Painting and Refinishing (B2) Technical Standards

7.1 Model proper safety procedures
7.2 Clean before repairing plastic
7.3 Identify the process of two-step cleaning, first with soap and water and second with solvent to remove two types of contamination
7.4 Clean before performing any grinding procedures on plastic to avoid grinding in contamination and to avoid solvent soaking into recently abraded plastic

CRT 8.0 — Mix and apply repair material to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Non-Structural Analysis and Damage Repair (B3) Technical Standards)

8.1 Model proper safety procedures
8.2 Apply a light coating of adhesion promoter and allow to dry adequately
8.3 Load, open and equalize the cartridge, attach the mixing nozzle and discard the first pump of material
8.4 Model proper spreading techniques. Apply a thin, tight coat of material, build in thin layers, and avoid air entrapment as they build slightly higher than the surrounding areas
8.5 Determine readiness to sand (check with fingernail to see if it leaves a white mark in the adhesive)

CRT 9.0 — Perform block and featheredge to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Non-Structural Analysis and Damage Repair (B3) Technical Standards

9.1 Model proper safety procedures
9.2 Employ 180 grit abrasive to "knock down" the bulk of the excess repair material without abrading the surrounding plastic, which would leave "fuzzies"
9.3 Employ 180 grit abrasive to successfully level the repair material and feather into the surrounding area

9.4 Finish sanding the repair and surrounding area with 320 grit abrasive to prepare for painting process

9.5 Recognize the best practice of reapplying adhesion promoter after the final sanding step to ensure that there are no paint adhesion issues

CRT 10.0 — Describe basic steering and suspension components of the vehicle to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair/Refinishing Mechanical and Electrical Components (B5) Technical Standards*

10.1 Identify the illustrated steering and suspension components

CRT 11.0 — Describe steering and suspension geometry to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair/Refinishing Mechanical and Electrical Components (B5) Technical Standards*

11.1 Apply the number of angle to the definition that describes it

11.2 Identify the problem or problems that result when the vehicle's tie rods and lower control arms pivot points do not remain parallel to each other as the vehicles body moves down (jounce) and up (rebound) as it travels along the road

CRT 12.0 — Perform structural damage analysis and related information to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Structural Analysis and Damage Repair (B4) Technical Standards*

12.1 Describe the structural damage analysis questions or complete the statement using the choices given

CRT 13.0 —Perform Structural realignment to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Structural Analysis and Damage Repair (B4) Technical Standards*

13.1 Illustrate the different types of structural realignments along with choices for supporting (blocking), securing (holding) and pulling the structure to realign it

13.2 Select the setup that is the most efficient for a high quality repair

CRT 14.0 — Determine the location of the vehicle's major control points using the damage simulator to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Structural Analysis and Damage Repair (B4) Technical Standards*

14.1 Locate the major control points of the vehicle's lower structure

CRT 15.0 — Gauge and measure the vehicle's lower structure using the damage simulator to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Structural Analysis and Damage Repair (B4) Technical Standards

15.1 Demonstrate proper safety procedures

15.2 Set the correct height (datum) dimensions on the gauges by using the data chart

15.3 Install the gauges at the major control points

CRT 16.0 — Read the gauges and measure using the damage simulator to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Structural Analysis and Damage Repair (B4) Technical Standards

16.1 Measure critical diagonal, length and width measurements of the structure

16.2 Sight the gauges and determine if there is a centerline (sideways) or height misalignment of the structure

CRT 17.0 — Diagram (document) the vehicle's structural misalignments using the damage simulator to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Structural Analysis and Damage Repair (B4) Technical Standards

17.1 Determine the types of structural misalignment present and record on the damage analysis diagram

CRT 18.0 — Gauge, measure and analyze structural, steering and suspension misalignment of a body on frame vehicle using the gauge measuring system to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Structural Analysis and Damage Repair (B4) Technical Standards

18.1 Measure the damaged vehicle's structure, steering and suspension by using a tram gauge and a tape measure

18.2 Determine the different types of misalignments that the vehicle's structure has sustained by using centerline and datum line gauges

18.3 Record the misalignments identified and analyze the types and amount of damage the vehicle has sustained

CRT 19.0 — Measure and analyze structural, steering and suspension misalignment of a unitized body vehicle using a computerized measuring system to related tasks in National Automotive Technicians Foundation (NATEF) Collision Repair and Refinishing Structural Analysis and Damage Repair (B4) Technical Standards*

19.1 Determine the different types of misalignment the vehicles structure, steering and suspension have sustained*

19.2 Record the misalignments identified and analyze the type and amount of damage the vehicle has sustained*

CRT 20.0 — Complete an estimate to related tasks in ASE Catalog of Collision Repair/Refinishing Tests B6 (Damage Analysis and Estimating)*

20.1 Report heading/legibility*
- 20.1.1 List entrant number on estimating test*
- 20.1.2 Locate provided "Vehicle Description and Labor Rate Page" and complete owner and vehicle information segment on estimate (e.g., owner name, address, phone numbers, license plate, vehicle year, series, mileage, vehicle identification number)
- 20.1.3 Write legibly*

20.2 Identify parts replacement*
- 20.2.1 Locate and select vehicle to be estimated in the provided collision estimating guide*
- 20.2.2 Locate and list the correct part prices and replacement labor times and refinish labor times for the predetermined parts being replaced*
- 20.2.3 Estimate labor adjustments for vehicle options when appropriate*
- 20.2.4 Recognize and apply body labor overlap and refinish labor overlapwhere appropriate*
- 20.2.5 Consider and apply "included" and "not included" operations where appropriate*
- 20.2.6 Consider and apply labor footnotes (= signs) when necessary*

20.3 Prepare Calculations*
- 20.3.1 Calculate and list the correct paint and materials allowance*
- 20.3.2 Calculate and list parts, body labor, refinish labor, paint and material column totals*
- 20.3.3 Calculate and list total labor hours (body labor plus refinish labor)*
- 20.3.4 Multiply total labor hours by providing labor rate and list labor dollar amount*
- 20.3.5 Calculate and list the total estimated amount*

CRT 21.0 — Oral Assessment/Interview*

21.1 Exhibit personal skills such as attendance, time management and individual responsibility
- 21.1.1 Demonstrate promptness when required to meet interviewer at specific time and location*

CRT 22.0 — Maintain professional conduct*

22.1 Demonstrate courteous behavior while waiting for the interviewer*

CRT 23.0 — Maintain professional appearance*

23.1 Demonstrate proper attire (SkillsUSA uniform- light blue shirt, dark blue pants)*

CRT 24.0 — Complete job application and resume*

24.1 Properly and legibly complete a job application and resume*

CRT 25.0 — Demonstrate interview skills*

Committee Identified Academic Skills

The technical committee has identified that the following academic skills are embedded in this contest.

Math Skills

- Understand the measurement angles on a three-dimensional object
- Understand the surface area and perimeter of three-dimensional objects
- Apply transformations (rotator turn, reflector flip, translator slide and dilator scale) the geometric figures
- Solve problem involving complementary, supplementary and congruent angles
- Solve problems involving symmetry and transformation
- Use measures of interior and exterior angles of polygons to solve problems
- Measure angles
- Make predictions using knowledge of probability
- Organize and describe data using matrixes
- Find surface area and perimeter of two-dimensional objects
- Use fractions to solve practical problems
- Solve practical problems using percents
- Calculate percentages
- Make comparisons, predictions and inferences using graphs and charts

Science Skills

- Use knowledge of mechanical, chemical and electrical energy
- Use knowledge of principles of electricity and magnetism (practical example: current and amperage settings on the GMA [MIG] welder in relationship to weld penetration)
- Use knowledge of static electricity
- Use knowledge of pressure in relation to the concept of force
- Use knowledge of simple machines and compound machines
- Use knowledge of potential and kinetic energy
- Use of knowledge of simple machines, compound machines, powered vehicles, rockets and restraining devices
- Describe characteristics of types of matter based on physical and chemical properties
- Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point and color)
- Use knowledge of chemical properties
- Describe and identify physical changes to matter
- Use knowledge of heat, light and sound energy
- Use knowledge of temperature scales, heat and heat transfer
- Plan and conduct a scientific investigation
- Use knowledge of work, force, mechanical advantage, efficiency and power

Language Arts Skills

- Demonstrate comprehension of a variety of informational text
- Demonstrate knowledge of appropriate reference materials
- Use print, electronic databases, online resources to access information in books and articles
- Provide information in conversations and in group discussions
- Provide information in oral presentations
- Demonstrate use of verbal communication skills: word choice, pitch, feeling, tone and voice
- Demonstrate use of nonverbal communication skills: eye contact, posture and gestures using interviewing techniques to gain information
- Organize and synthesize information for use in written and oral presentations
- Edit writing for grammar, capitalization, punctuation, spelling, sentence structure and paragraphing

Connections to National Standards

State-level academic curriculum specialists identified the following connections to national academic standards.

Math standards

- Problem Solving
- Numbers and Operations
- Measurement
- Geometry
- Representation
- Communication
- Connections

Source: NCTM Principles and Standards for School Mathematics. To view high school standards, visit: standards.nctm.org/document/chapter7/index.htm. Select "Standards" from menu.

Science Standards

- Understands the structure and properties of matter
- Understands the sources and properties of energy
- Understands forces and motion
- Understands the nature of scientific inquiry

Source: McREL compendium of national science standards. To view and search the compendium, visit: www.mcrel.org/standards-benchmarks/.

Language Arts standards

- Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, and graphics)
- Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
- Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information)

Source: IRA/NCTE Standards for the English Language Arts. To view the standards, visit: www.readwritethink.org/standards/index.html.

CONTEST SCORECARD

Items Evaluated	Possible Points
Metal Repair	175
Welding	175
Structural Analysis	175
Plastic Repair	175
Estimating	100
Oral Assessment/Résumé	100
Written Exam (ASE)	100
Sub Total	**1,000**
Clothing Penalty	_____
TOTAL	_____